

**Listing of Claims:**

Claim 1. (currently amended) A self-supporting reactive hot-melt adhesive element comprising:

a reactive one-component hot-melt adhesive which is solid at room-temperature, wherein said reactive one-component hot-melt adhesive comprises:

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- (i) 0.5 to 30% w/w relative to the reactive hot-melt adhesive element of at least one isocyanate which is solid or liquid at room-temperature; and
  - (ii) 20 to 90% w/w relative to the reactive hot-melt adhesive element of at least one isocyanate-reactive polymer and/or resin which is solid at room-temperature;
  - (iii) up to 60% w/w relative to the reactive hot-melt adhesive element of a non-isocyanate-reactive polymer, wax and/or resin; and
- wherein the content of free NCO-groups in said reactive hot-melt adhesive element is at least 0.5% w/w relative to the reactive hot-melt adhesive element.

Claim 2. (currently amended) The reactive hot-melt adhesive element of claim 1, wherein said least one isocyanate-reactive polymer and/or resin forms a solid matrix at room-temperature; ~~especially and~~ wherein said least one isocyanate is one of (a) embedded in said reactive polymer and/or resin matrix and/or ~~wherein said least one isocyanate is (b)~~ homogeneously distributed ~~over~~ throughout said least one reactive polymer and/or resin matrix.

Claim 3. (currently amended) The reactive hot-melt adhesive element of claim 1, wherein said least one isocyanate is an aliphatic and/or aromatic di- and/or polyisocyanate, ~~in particular~~

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with free terminal NCO-groups, ~~especially wherein~~ said isocyanate is being selected preferably from the group consisting of: diisocyanatodiphenylmethanes (MDIs), ~~in particular~~ 4,4'-diisocyanatodiphenylmethane and 2,4'-diisocyanatodiphenylmethane and mixtures of various diisocyanatodiphenylmethanes; 1,5-diisocyanatonaphthalene (NDI); diisocyanatotoluenes (TDIs), ~~in particular~~ 2,4-diisocyanatotoluene, ~~as well as and~~ TDI-urethdiones, ~~in particular~~ dimeric 1-methyl-2,4-phenylene-diisocyanate (TDI-U), and TDI-carbamides; 1-isocyanato-3-isocyanatomethyl-3,5,5-trimethylcyclohexane (IPDI) and its isomers and derivatives, ~~in particular~~ di-, tri- and polymerisates, ~~as well as and~~ IPDI-isocyanurate (IPDI-T); 3,3'-dimethylbiphenyl-4,4'-diisocyanate (TODI); 3,3'-diisocyanato-4,4'-dimethyl-N,N'-diphenylcarbamide (TDIH); as well as mixtures ~~and prepolymers of the aforementioned compounds thereof.~~

Claim 4. (currently amended) The reactive hot-melt adhesive element of claim 1, wherein the content of free NCO-groups in said reactive hot-melt adhesive element is ~~at least 0.5 %w/w, in particular at least 1 %w/w, preferably at least 1.5 %w/w, especially preferred at least 2 %w/w,~~ relative to the reactive hot-melt adhesive element.

Claim 5. (currently amended) The reactive hot-melt adhesive element of claim 1, wherein said least one isocyanate is a mixture of 4,4'-diisocyanatodiphenylmethane and 2,4'-diisocyanatodiphenylmethane, ~~preferably with~~ having a content of 2,4'-diisocyanatodiphenylmethane exceeding 20 %w/w, ~~in particular exceeding 30 %w/w, preferably exceeding 40 %w/w, especially preferred exceeding 50 %w/w,~~ relative to the isocyanate mixture.

Claim 6. (currently amended) The reactive hot-melt adhesive element of claim 1, wherein said least one isocyanate has masking and/or blocking groups, said groups being able to split off ~~in particular~~ during exposure to heat and/or moisture.

Claim 7. (currently amended) The reactive hot-melt adhesive element of claim 1, wherein said least one isocyanate is an encapsulated or surface-deactivated isocyanate, said encapsulation or surface-deactivation being ~~preferably~~ broken up at temperatures exceeding room-temperature.

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Claim 8 (cancelled)

Claim 9.(currently amended) The reactive hot-melt adhesive element of claim 1, wherein said least one isocyanate-reactive polymer and/or resin comprises at least two isocyanate-reactive groups or isocyanate-reactive hydrogen atoms per molecule, ~~in particular hydroxyl, amino, carboxyl and/or carbonamide groups.~~

Claim 10. (currently amended) The reactive hot-melt adhesive element of claim 1, wherein said least one isocyanate-reactive polymer and/or resin has an average molecular weight exceeding 8,000 g/mol, ~~in particular of 10,000 to 50,000 g/mol, preferably 10,000 to 30,000 g/mol,~~ and/or said least one isocyanate-reactive polymer and/or resin is ~~preferably~~ selected from the group consisting of isocyanate-reactive polymers and/or copolymers, ~~especially isocyanate-reactive polyesters, polycaprolactone polyesters, polyethers, polyurethanes, polyamides, polytetrahydrofuranes, polyacrylates and polymethacrylates and their copolymers and mixtures.~~

Claim 11. (no change)      The reactive hot-melt adhesive element of claim 1, wherein said least one isocyanate-reactive polymer and/or resin and said least one isocyanate are homogeneously distributed in each other.

Claim 12 (cancelled)

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Claim 13. (currently amended) The reactive hot-melt adhesive element of claim 1, further comprising at least one catalyst, preferably in amounts of from 0.01 to 5 %w/w relative to the reactive hot-melt adhesive element, said catalyst preferably being homogeneously distributed over said least one isocyanate-reactive polymer and/or resin matrix and embedded herein, especially wherein said catalyst being ~~is a catalyst common or known from polyurethane chemistry, in particular selected from the group consisting of organic tin compounds such as dibutyl tin dilaurate (DBTL) or alkylmercaptide compounds of dibutyl tin; organic iron, lead, cobalt, bismuth, antimony and zinc compounds and mixtures of these compounds; and catalysts based on amines such as tertiary amines, 1,4-diazabicyclo-[2,2,2]-octane and dimorpholinodiethyl ether; as well as mixtures of these compounds.~~

Claim 14. (currently amended)      The reactive hot-melt adhesive element of claim 1, ~~further comprising at least one non-isocyanate-reactive polymer, wax and/or resin, which is preferably homogeneously distributed over said least one isocyanate-reactive polymer and/or resin matrix, preferably in amounts of from 0 to 60 %w/w relative to the reactive hot-melt adhesive element, especially~~ wherein said non-isocyanate-reactive polymer, wax and/or resin is preferably selected from the group consisting of:

(i) aliphatic, cyclic or cycloaliphatic hydrocarbon resins, terpene phenol resins, cumarone indene resins,  $\alpha$ -methylstyrene resins, polymerized liquid resin esters ~~or~~ and ketonaldehyde resins, ~~in particular resins~~ with low acid values preferably of less than 1 mg KOH/g;

(ii) ethylene/vinyl acetate polymers ~~or~~ and copolymers, ~~in particular those~~ with vinyl acetate contents of between 12 and 40 %w/w, ~~in particular 18 to 28 %w/w~~, and/or with melt indices (MFIs, DIN 53735) of 8 to 800, ~~in particular 150 to 500~~;

A (iii) polyolefins, ~~in particular~~ with average molecular weights of 5,000 to 25,000 g/mol, preferably 10,000 to 20,000 g/mol, and/or with ring and ball softening ranges of between 80 and 170 °C, ~~preferably between 80 and 130 °C~~;

(iv) (meth)acrylates ~~such as styrene~~(meth)acrylates; and

(v) polyolefin waxes, ~~in particular polyethylene and polypropylene waxes,~~ and modified waxes on this basis;

and mixtures of these compounds.

Claim 15. (currently amended) The reactive hot-melt adhesive element of claim 14, wherein said least one non-isocyanate-reactive polymer, wax and/or resin combines with said least one isocyanate-reactive polymer and/or resin to form a matrix into which said least one isocyanate and optionally said other constituents of the reactive hot-melt adhesive element are incorporated, preferably in a homogeneous distribution.

Claim 16. (currently amended). The reactive hot-melt adhesive element of claim 1, further comprising at least one isocyanate-reactive mono-functional additive, ~~preferably~~ in an amount of from 0 to 20 %w/w relative to the reactive hot-melt adhesive element, said least one mono-functional additive being ~~preferably~~ selected from the group consisting of mono-functional amines, alcohols, mercaptans and ~~other~~ mono-functional additives which comprise an isocyanate-reactive functional group.

A1 Claim 17. (no change) The reactive hot-melt adhesive element of claim 1, wherein the individual constituents or contents are embedded and homogeneously distributed in each other.

Claim 18. (currently amended). The reactive hot-melt adhesive element of claim 1, wherein said adhesive element is non-sticky or non-adhesive at room-temperature and becomes sticky or adhesive at temperatures above room-temperature, ~~in particular at temperatures of from 60 °C to 160 °C~~, and begins to cross-link above room-temperature, ~~in particular at a temperature of from 60 °C to 160 °C~~; and wherein the duration of cross-linking is less than 10 minutes, ~~in particular less than 5 minutes, at temperatures of from 100 °C to 160 °C, in particular in the case of a solid isocyanate.~~

Claim 19. (currently amended). The reactive hot-melt adhesive element of claim 18, wherein when the cross-linking process has been initiated via heating to a temperature above room-temperature, ~~in particular 100 °C to 160 °C~~, followed by immediate cooling to room-

temperature, the duration of cross-linking is for about 5 to 8 days at room-temperature, ~~in particular in the case of a solid isocyanate.~~

Claim 20. (no change)      The reactive hot-melt adhesive element of claim 1, wherein said adhesive element cross-links during exposure to heat and/or moisture.

Claim 21. (currently amended).      The reactive hot-melt adhesive element of claim 1, having a layer thickness of 10  $\mu\text{m}$  to 1,000  $\mu\text{m}$ , ~~in particular 50  $\mu\text{m}$  to 500  $\mu\text{m}$ , preferably 100  $\mu\text{m}$  to 300  $\mu\text{m}$ .~~

Claim 22. (no change)      The reactive hot-melt adhesive element of claim 1, in the form of a foil, film, strip or reactive adhesive tape, which may optionally be wound into a roll and/or stored in a cassette.

Claim 23.(currently amended)      A The reactive hot-melt adhesive element of claim 1, further comprising:

~~from 0.5 to 30 % w/w. of at least one isocyanate;~~

~~from 20 to 90 %w/w of at least one isocyanate-reactive polymer and/or resin;~~

~~from 0 to 20 %w/w of at least one isocyanate-reactive, mono-functional additive;~~

~~from 0 to 60 %w/w of at least one non-isocyanate-reactive polymer, wax and/or resin; and~~

~~optionally, up to 5 %w/w, in particular in amounts of from 0.01 to 5 %w/w of a catalyst; and~~

optionally, up to 25 %w/w, ~~in particular in amounts of from 1 to 25 %w/w,~~  
~~preferably 5 to 20 %w/w~~ of at least one additive for improving heat conductivity and/or  
sensitivity to radiation induction;

all said amounts being based on the reactive hot-melt adhesive element.

Claims 24 through 27 (cancelled)

Claim 28. (currently amended)      A process for manufacturing the reactive hot-melt  
adhesive element of claim 1, said process comprising:

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- a) mixing the individual constituents or contents, ~~in particular while mildly~~  
~~heating,~~ but without a reaction between the individual constituents or contents  
taking place in the case of a solid isocyanate;
  - b) optionally, cooling or permitting to cool the resulting mixture or mass until  
said mixture or mass cools and/or hardens;
  - c) processing the mixture or mass to a film, optionally with heating to above  
room-temperature, but without a reaction between the individual constituents  
or contents taking place;
  - d) optionally, cooling or permitting the film to cool to room-temperature; and
  - e) optionally, further processing the film, ~~in particular dimensioning (such as~~  
into foils, or smaller pieces etc.) and/or winding into rolls.



Claim 29. (currently amended). An adhesive bonding process for the permanent bonding of substrates to be joined, comprising:

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- a) providing a first and a second substrate to be bonded;
  - b) applying the reactive hot-melt adhesive element of claim 1 to at least a region of the first substrate, ~~in particular~~ during exposure to heat and/or pressure, if ~~necessary~~ optionally while melting the reactive constituents and thereby initiating the cross-linking process;
  - c) joining said first and second substrates while contacting said second substrate with at least the region of the first substrate provided with the reactive hot-melt adhesive element, ~~preferably under pressure~~;
  - d) pressing together said two substrates, ~~if necessary~~ while initiating the cross-linking process, ~~in particular~~ during exposure to heat and/or moisture; and ~~then~~ thereafter;
  - e) hardening or curing, optionally during exposure to pressure and/or heat and/or moisture.

Claim 30. (currently amended). An adhesive bonding process for the permanent bonding of substrates to be joined, comprising:

- a) providing a first and a second substrate to be bonded and the reactive hot-melt adhesive element according to claim 1;
- b) joining said first and second substrate with said reactive hot-melt adhesive element being positioned between said first and second substrates;

- c) pressing together said first and second substrates joined together in step b), ~~in particular~~ during exposure to heat and/or moisture, ~~preferably~~ while melting the reactive constituents and thereby initiating the cross-linking process; and ~~then~~ thereafter
- d) hardening or curing, optionally during exposure to pressure and/or heat and/or moisture.

Claim 31. (New) A self-supporting reactive hot-melt adhesive element, comprising:  
a reactive one-component hot-melt adhesive which is solid at room-temperature, wherein  
said reactive one-component hot-melt adhesive comprises:

- (i) 0.5 to 30% w/w relative to the reactive hot-melt adhesive element of a mixture of at least two aliphatic and/or aromatic di- and/or polyisocyanates which are solid or liquid at room-temperature wherein at least one of said di-and/or polyisocyanates in said mixture is an unsymmetrically substituted di- and/or polyisocyanate comprising isocyanate functions of different reactivity; and
- (ii) 20 to 90% w/w relative to the reactive hot-melt adhesive element of at least one isocyanate -reactive polymer and/or resin which is solid at room-temperature; and

wherein the content of free NCO-groups in said reactive hot-melt adhesive element is at least 0.5% w/w relative to the reactive hot-melt adhesive element.

Claim 32. (New) The reactive hot-melt adhesive element of claim 31, wherein said isocyanate mixture comprises a mixture of 4,4'-diisocyanatodiphenylmethane and 2,4'-diisocyanatodiphenylmethane, the content of 2,4'-diisocyanatodiphenylmethane exceeding 20% w/w, relative to the isocyanate mixture.

Claim 33. (New) A process for manufacturing the reactive hot-melt adhesive element of claim 31, said process comprising:

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- a) mixing the individual constituents or contents, without a reaction between the individual constituents or contents taking place in the case of a solid isocyanate;
  - b) optionally, cooling or permitting to cool the resulting mixture or mass until said mixture or mass cools and/or hardens;
  - c) processing the mixture or mass to a film, optionally with heating to above room-temperature, but without a reaction between the individual constituents or contents taking place;
  - d) optionally, cooling or permitting the film to cool to room-temperature; and
  - e) optionally, further processing the film, into foils, or smaller pieces etc. and/or winding into rolls.

Claim 34. (New) An adhesive bonding process for the permanent bonding of substrates to be joined, comprising:

- a) providing a first and a second substrate to be bonded;
- b) applying the reactive hot-melt adhesive element of claim 31 to at least a region of the first substrate, during exposure to heat and/or pressure, optionally while melting the reactive constituents and thereby initiating the cross-linking process;

- c) joining said first and second substrates while contacting said second substrate with at least the region of the first substrate provided with the reactive hot-melt adhesive element;
- d) pressing together said two substrates, while initiating the cross-linking process, during exposure to heat and/or moisture; and thereafter;
- e) hardening or curing, optionally during exposure to pressure and/or heat and/or moisture.

AI Claim 35. (New) An adhesive bonding process for the permanent bonding of substrates to be joined, comprising:

- a) providing a first and a second substrate to be bonded and the reactive hot-melt adhesive element according to claim 31;
  - b) joining said first and second substrate with said reactive hot-melt adhesive element being positioned between said first and second substrates;
  - c) pressing together said first and second substrates joined together in step b), during exposure to heat and/or moisture, while melting the reactive constituents and thereby initiating the cross-linking process; and then
  - d) hardening or curing, optionally during exposure to pressure and/or heat and/or moisture.
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